



Productivity and Technical Efficiency of Family Poultry Production in Kurmi local Government Area of Taraba State, Nigeria

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Abstract. This study assessed the socio – economic characteristics and technical efficiency of family poultry production in Kurmi Local Government Area of Taraba state, Nigeria. The result of the study reveals that the respondents are relatively young with mean age of 44 years. Findings from the study showed that female constitutes 60% of the family poultry producers in the study area. The result also reveals that the main reason for rearing family poultry is for sales. The technical efficiency estimate showed that the technical efficiency of family poultry ranges between 0.29 and 0.84, with a mean of 0.63. This indicates that on the average, the respondents are 63% efficient in the use of combination of their inputs. Return on investment (ROI) is 0.76 meaning that family poultry is highly profitable. This high profitability should attract financing by lending institutions. The elasticity estimate of 3.18 indicates that the family poultry production is taking place at stage 1 (inefficient stage) in production curve. This study concludes that the output and technical efficiency of the family poultry production can be increased by the use of more feed, capital, medicine/vaccine and adoption of more innovations.

Key words: Productivity, technical , efficiency, family, poultry.

Background of the Study

The importance of poultry to the national economy cannot be over emphasized, as it has become popular industry for the small scale holders that have great contribution to the economy of the country. The profession has

assumed great importance in improving the employment opportunity and animal food production in Nigeria (1).

Report by Federal Office of Statistics FOS, (10) revealed that food production in Nigeria has not increased at the rate that it can meet the increasing population. While the food production increased at a rate of 2.5% food demand increase at a rate of 3.5% to the high rate of population growth of 2.83%. The apparent disparity between the rate of food to increase the production of livestock products and demand for food in Nigeria as observed by Ojo, (14) has led to: a food demand and supply thus leading to a widening gap between domestic food and total food requirement, an increasing demand that resort to food importation and high rates of increase in food prices.

Study by Ojo, (14) further revealed that the wide spread of hunger and malnutrition are evident of the above statement in the country. Apart from Nigeria agriculture not meeting up in its food production to meet food requirement of the raising population (17), its greatest problem is that of inadequate animal protein in diets of a large proportion of the population especially in the rural areas which constitutes over 70% of the Nigerian population.

Animal protein is essential in human nutrition because of its biological significance (14). In realization of the importance of animal protein various government in Nigeria have been pursuing programmes at the national, state, and community level to ensure the attainment of Food and Agriculture Organization (FAO) recommendation of thirty five grams (35g) per caput of animal protein per day. Some of those programmes include the farm settlement scheme (FSS), Agriculture development projects (ADP), Better life programme, Micro credit for livestock production and lately the United Nation Development Programme (UNDP). The UNDP programme is sponsoring the establishment of livestock parent / foundation stock at community level in Nigeria with the following objectives (24): o train farmers on improved livestock breeds for gradual upgrading of local breeds, and to train farmers on improved and modern rearing and production method of livestock, consequently farmers income.

Ojo,(14) reported that poultry keeping has the following advantages over other livestock:

- (a) Poultry birds are good converters of feeds into usable protein in meat and eggs.
- (b) The production cost per unit is low relative to other types of livestock and return to investment is high, thus farmers need just a small amount of capital to start a poultry farm.
- (c) Poultry meat is very tender. So its palatability and acceptability to consumers are very high.
- (d) It has a short production cycle (pay back period) through which capital is not tied down over a long period.
- (e) Egg, which is one of the major products of poultry production is one of the most nutritious and complete foods known to man. Chicken egg protein has biological value of 1.0 and so shares with human protein the distinction of being a perfect protein (18).
- (f) Egg, is more easily affordable by the common man than other sources of animal protein. An average boiled egg cost about ₦ 30 hence boiled eggs are being sold (hawked) freely at motor parks, Railway station, market places, schools and road sides in Nigeria.

An earlier report by Okonkwo and Akubuo (15) revealed that about 10% of the Nigerian population engage in poultry production mostly on subsistence and small or medium sized farms. Presently the industry had been adversely affected by stringent government economy measure. The measure had been very pronounced on poultry production due to high level of sensitivity of the industry to management factors and resultant effects on live and productivity of the birds. Ojo (14) reported that the industry falls short of its aim of self-sufficiency in animal protein consumption in the country that is put at 5gm/ caput per day.

The objectives of the study are to assess the socio – economic characteristics of the family poultry production in the study area; to determine the cost and revenue structure of the family poultry production; to estimate technical efficiency of each producer and to determine the technical efficiency of family poultry production.

Methodology

The study was carried out in Kurmi local Government Area of Taraba State, Nigeria. The Local Government is located in the Central zone of the State. Three villages were purposively selected for this study, namely Baissa, Didan and Sabon Gidan Tukura. With the assistance of key informants, lists of poultry farmers in each of the selected villages were compiled. Thirty farmers were randomly selected in Baissa, 15 each in Didan and Sabon Gidan Tukura to make a total of 60 family poultry farmers for the study. The data which were mainly from primary sources were obtained in the 2009 rearing season using structured questionnaires. The focus was on socio-economic characteristics of the farmers, output costs and returns.

Data Analysis

Data collected from 60 respondents were analysed using percentage distribution, profitability ratios and stochastic frontier production function.

The stochastic frontier production function was specified as:

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + (V_i - U_i) \dots\dots\dots(1)$$

Where:

Y = Income from family poultry (₦)

X_1 = Expenses on feeds (₦)

X_2 = Expenses on medicines/vaccines (₦)

X_3 = Income from other livestock (₦) [Proxy for capital]

V_i = random error assumed to be independent of U_i , identical and normally

Distributed with zero mean and constant variance $N(0, \sigma^2_v)$

U_i = technical inefficiency effects which are assumed to be independent of

V_i , they are non-negative truncation at zero or half normal distribution with $N(\mu, \sigma^2_u)$

If $U_i = 0$ no allocative inefficiency occurs, the production lies on the stochastic frontier. If $U_i > 0$, production lies below the frontier and it is inefficient. Technical Inefficiency Model in addition to the general model, was defined to estimate the influence of some farmer's socio-economic variables on the technical efficiencies of the farmers. The model is defined by (9):

$$U_i = \partial_0 + \partial_1 Z_1 + \partial_2 Z_2 + \partial_3 Z_3 + \partial_4 Z_4 \dots\dots\dots(2)$$

Where:

U_i is as defined before

Z_1 = Family size (number)

Z_2 = Gender (dummy, 1 for male and 0, otherwise)

Z_3 = Age of the farmers in years (years).

Z_4 = Index of innovation adoption (ratio of number of innovation adoption out of maximum of 6 specified in the questionnaire)

δ 's, β 's and γ coefficients are unknown parameters to be estimated along with the various parameters which are expressed in terms of

$$\delta^2_s = \delta^2_v + \delta^2_u; \gamma (\text{gamma}) = \delta^2_u / \delta^2_s$$

Where the γ - parameter has value between zero and one, ($0 \leq \gamma < 1$). The parameters of stochastic frontier production function (SFPF) model were obtained by maximum likelihood estimation method using the computer programme, Frontier 4.1 where equations (1) and (2) were jointly estimated.

Profitability ratio

Profitability index (PI) or return on scale NI/TR

$$\text{Rate of return on investment (RRI\%)} = \text{NI/TC} * 100 \dots \dots \dots (3)$$

where

NI = net income

TR = total revenue

TC = total cost

$$\text{NI} = \text{TR} - \text{TC}$$

Results and Discussion

Results

Table 1 shows that the respondents are relatively young with mean age of 44 years. The mean years of schooling was 9 years, which indicates that majority of them were educated above primary school.. The table also indicates that the family size is 9. Female constitutes 60% while male constitutes 40% of the family poultry producer in the study area as indicated in Table 1, Table 2 shows that the main reason for rearing family poultry is for sales. Greater number (53%) of the respondents indicated that they reared the family poultry

for sales. Table 2 also implied the food security implication of family poultry in the study area. The table indicates that about 38% and 7% of respondents in the study area consumed the family poultry produce at home and during ceremonies respectively while 2% are used for other purposes. Result from Table 3 reveals that medication constitutes 74.9% of the variable cost of the producing family poultry in the study area, feed constitutes about 20% of the variable cost while the chicks constitutes 5.5% of the variable cost. The costs of housing and replacement stock were excluded because majority of the respondents did not pay for housing and replacement stocks. The estimated cost of medication/vaccine is 80%.

The Table 2 also indicates that sales of live birds and eggs constitute 81% and 19% of total revenue of the family poultry. Table 3 indicates that the annual average profit is ₦29,637, the return on investment (ROI) is 0.76, and this shows that family poultry is highly profitable. Table 4 shows the maximum likelihood estimates of family poultry production in the study area. The table indicates a positive relationship between the expenses on feed, medicine and vaccines, income from other livestock (capital) and family poultry income. The relationship is also significant at 5% level of significance. Considering the coefficient of the determinants of the income of the family poultry in Table 4, feed coefficient has the highest value of 2.250. Inefficiency parameters show that age is negatively related to family poultry production. However, it is not a significant at 5% level of significance. Family size, gender and index of innovation adoption have significant and negative relationships with the inefficiency of family production in the study area. The table also shows that the estimate of variance parameter (δ^2) is 23.941 and that the gamma (δ) is 0.910, close to one, which indicates that the inefficiency effects are highly significant in the analysis of the income of family poultry production in the study area.

The log likelihood function was estimated to be -113.690. This value represents the value that maximizes the joint densities in the estimated model. The predicted technical efficiency varies widely across the respondents, ranging between 0.29 and 0.84 (on the scale of maximum one) with a mean of 0.63. The elasticity estimate (Summation of various coefficients of expenses on feed, hawk

attack, expenses on medicine/ vaccine and income from other livestock) is 3.18 (Table 5)

DISCUSSION

The study shows that the level of education of the respondents is higher when compared with national adult illiteracy level of 30% and 48% for male and female in Nigeria respectively (25). Illiteracy is heavily regarded as a major limitation to technology adoption in livestock and crop production in Nigeria. The high level of education will enable respondent to access relevant information that will stimulate their production. The respondents' large household size is above the recommended average of four per family in Nigeria. The large family size is relevant to family poultry because family labour constitutes the bulk of labour supply in family poultry production in Nigeria (6). The fact that majority of the family poultry keepers are women is consistent with 56% estimated by Sonaiya, (22) in Nigeria. It has been demonstrated that women in rural area of Nigeria generate most of their income from poultry (4). It is evident from the result of the study that the main reason for family poultry is for income generation. In fact, Sonaiya (21) noted that in poor producer families, female poultry products are not consumed but are mainly sold when household is in need of cash. The income from the sale of the poultry product is additional revenue.

Alabi and Osifo (5) demonstrated that income from family poultry contributes significantly to woman cash economy in Nigeria. Sonaiya (22) estimated that poultry product sold contribute about 15% of the annual financial income for rural household. The information on the breakdown of the sales of family poultry in Nigeria shows that 87% and 13% of the sales revenue were from sales of live bird and egg respectively (23). The food security implication of family poultry is also implied in Table 2. Since protein from poultry products are biologically superior than protein from plant, consumption of these products will increase the supply of essential amino acids in their diet.

Analysis of proportion of meat and egg from family poultry consumed by Nigerian shows that meat and egg constitute 82% and 18% respectively (22). The

cost structure in family poultry is slightly different from the cost component in commercial poultry production where feed accounts for more than 60% (7). This is because family poultry depend on human habitat for their feed. Free-range birds do not receive sufficient feed but survive on scavenging, spent grain and chicken waste from household with minimum cost. The estimated cost of medication and vaccine of 80% is higher than 14% estimated by Sonaiya (22). This may be due to the increase in prices of medicine and vaccines between 2007 and 2008 in Nigeria. The table also indicates that sales of live birds and eggs constitute 81% and 19% of total revenue of the family poultry. This is comparable with 87% and 13% for sales of live birds and eggs estimated by Obi and Sonaiya (13) in Osun State and 79% and 21% by Alabi and Aruna, (3) in Niger Delta, Nigeria.

The annual average profit was computed to be ₦29,637 The return on investment (ROI) of 0.76 shows that family poultry is highly profitable. This high profitability should attract financing by lending institutions. The direct interpretation is that if the family poultry is financed by lending institution with ₦10,000 at an interest rate of 10%, the family poultry will generate ₦17,600 This means that the borrower will be able to return the principal (₦10,000), the interest of ₦1000 and retain about ₦7600 as his profit. The positive and significant relationship between expenses on the feed, medicine/vaccine and income from other livestock (capital) indicates that if more feeds, medicine and vaccines are given to the family poultry, there will be more than proportionate increase in the output of family poultry.

The positive and significant relationships between feeds, drugs and output of commercial poultry production have been documented by (2); (12). Since feed has highest coefficient it means that increase can be more experienced in income of family poultry by increasing the feed (quality and quantity) given to the family poultry than by increase in any other factor that influence family poultry income as specified in this study. The importance of feed in stimulating poultry production in Nigeria has been expressed by (17). The relative importance of feed in family poultry production cannot be over-emphasised. According to Sonaiya (22), energy is the first limiting nutrient as food available on the range contains

a lot of crude fibre. That is why energy supplements may increase production significantly. Inefficiency parameters establish the fact that inefficiency of family poultry production decreases with increase in family size. This may be due to the fact that family poultry depends on family member as labour and feed supply.

The significant and negative relationship between gender and inefficiency of family poultry production suggests that inefficiency is less among female than male. This may be due to the fact that women are more involved in family production than men, hence they have developed caring techniques superior to that of men. It may also be due to the fact they stay more at home caring for family poultry than men. It may also be attributed to tender nature of women that is more than that of men. The implication of this is that women may efficiently generate more income from family poultry than men. Hence, strategies/intervention that will increase women income may consider this option.

The study also indicates that as the number of innovation adoption increases, inefficiency of family production decreases. Innovation adoption has been shown to improve the productivity of the farmers (16). Innovation that are related to management of family poultry such as regular watering, light enclosure, vaccination, medication and feeding can bring about significant improvement in productivity of family poultry (19) (in Burkina Faso); (8) (in Niger); (22) (in Nigeria). The level of innovation adoption among the family poultry producer is low in Nigeria generally, because of low contact with extension agent (11). Sonaiya (22) reported that less than 5% of family poultry producers in Nigeria had any contact with poultry extension agents. Even the crop of extension agents in Nigeria has no mandate for family poultry production. That is why any producer that has contact with technological information that can improve their production and make use of the information will be more efficient than those who are not. The high variance parameter (δ^2) and gamma (δ) close to one, which indicates that the inefficiency effects are highly significant in the analysis of the income of family poultry production in the study area (if the gamma is zero, the variance of the inefficiency effect is zero and so the model reduces to traditional average response function in which the variables of age, family size, gender and index of innovation adoption are included in the

production function). The log likelihood function estimated to be -113.68 . This value represents the value that maximizes the joint densities in the estimated model.

The mean technical efficiency of 0.63 suggests that the family poultry producers are 63% efficient in the use of combination of their inputs. Since the elasticity is greater than one, it suggests that the producers of family poultry are operating at stage one in production curve. At this stage, marginal product of family poultry is greater than average product. This is an inefficient stage, because increase in the use of inputs will lead to more than proportional increase in output. This means that the family poultry producers are inefficient at their level of production and that their income and output can be improved if more of feeds, capital, vaccine and medicine are used and more innovation that are related to improved management are adopted.

CONCLUSION AND RECOMMENDATION

CONCLUSION

The study reveals that female constitutes the greater percentage (60%) of the family poultry production than their male counterpart which constitutes 40%. Also greater number (53%) of the respondents indicated that the main reason for rearing family poultry is for sales. The study also reveals that greater percentage (80%) of the variable cost was spent on medicine/ vaccine while feed constitutes just 20% of the variable cost. Return on investment (ROI) is 0.76 meaning that family poultry is highly profitable. This high profitability should attract financing by lending institutions. The predicted technical efficiency varies widely across the respondents ranging between 0.29 and 0.84 with a mean of 0.63. The elasticity estimate is 3.18 meaning that elasticity of production is greater than one.

RECOMMENDATION

Based on findings of this study, the following recommendations were advanced towards alleviating the problems being encountered by poultry farmers in increasing their productivity. Therefore, it is recommended that:

- (i) Government policy should be made to improve the provision of input such as local feeds and drugs to family poultry production affordable prices
- (ii) poultry farmers should be encouraged to have access to financial institutions in obtaining loan at low interest rates.
- (iii) Capital should be channelled to family poultry production through the provision of micro- credit and formation of cooperative societies.
- (iv) Extension activities should focus on training of farmers on the improved production management to enable them use the available resources efficiently and increase productivity.
- (v) Extension agency should be mandated to disseminate improved technology that will stimulate family poultry production in the study area.

Table 1: Socio-economic Characteristics of the respondent

Socio-economic characteristics	Mean
Age	45 years
Year of schooling	9years
Family size	9
Gender	
Male	40%
Female	60%

Source: Field Survey, 2009

Table 2: Distribution of respondents according to their objectives of rearing family poultry

Objectives	Number of respondents	%
Sales	32	53
Home consumption	23	38
Ceremonial consumption	4	7
Other	1	2
Total	60	100

Source: Field Survey, 2009 *Multiple responses

Table 3: Cost and Returns component in family poultry production in the study area

Cost and Returns	Amount (₦)	%
Chicks	12,800	5.5
Feed	45,854	19.6
Medication/vaccine	175242	74.9
Total cost	233896	100
Returns		
Live Birds	1795439	81
Eggs	416672	19
Total	2212111	100
Profit	1778216	
Average Profit	29,637	
Return on Investment	0.76	

Source: Field Survey, 2009

Table 4: Maximum likelihood estimates of stochastic frontier production function and inefficiency parameters family poultry.

Variables	parameters	Coefficient	t-ratio
Constant	β_0	1.549	0.604
Expenses on feed (X_1)	B_1	2.250	1.922*
Expenses on medication/vaccine (X_2)	B_2	2.032	1.633*
Income from other livestock (X_3)	B_3	1.118	1.453*
Expense on Chicks	β_4	-2.220	0.875
Inefficiency Parameters			
Family size (Z_1)	∂_1	-1.580	-2.290*
Gender (Z_2)	∂_2	-1.071	-1.362*
Age of the farmers(Z_3)	∂_3	-2.229	-0.567
Index of innovation adoption(Z_4)	∂_4	-0.828	-1.548*
Gamma (δ)		0.910	6.345*
Variance parameter (δ^2)		23.941	3.624*
Log likelihood (γ)		-113.69	
Technical Efficiency			
Mean =		0.63	
Minimum =		0.29	
Maximum =		0.84	

Source: Field Survey, 2009 *Significant at 5%

Table 5: Elasticities and Return to scale of the parameters of stochastic frontier production function

Variables	Elasticities ratio
Expenses on feed	2.250
Expenses on medication/ vaccines	2.032
Expenses on medication/ vaccines	1.118
Expense on Chicks	-2.220
Return to Scale (RTS)	3.18

Source: Field Survey 2009

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